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Why do policy decision-makers opt for command and control environmental regulation? An economic analysis with special reference to Sri Lanka

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This chapter examines why policy decision-makers opt for command and control environmental regulation despite the availability of a plethora of market-based instruments which are more efficient and cost-effective. Interestingly, Sri Lanka has adopted a wholly command and control system, during both the pre and post liberalisation economic policies. This chapter first examines the merits and demerits of command and control and market-based approaches and then looks at Sri Lanka's extensive environmental regulatory framework. The chapter then examines the likely reasons as to why the country has gone down the path of inflexible regulatory measures and has become entrenched in them. The various hypotheses are discussed and empirical evidence is provided. The chapter also discusses the consequences of an environmentally slack economy and policy implications stemming from adopting a wholly regulatory approach. The chapter concludes with a discussion of the main results.

Keywords: Command and control vs market-based instruments, Environmental and health effects, Economic analysis, Policy implications

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Abstract

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1. Introduction

It is with great pleasure that we write this festschrift chapter in honour of Professor Buddhadasa Hewavitharana, one of the few well versed and versatile economists of pre and post liberalisation economic policies. Hence, it is apt to select a topic on command and control (C&C) pollution control approaches which is synonymous with pre-market reforms and compare them with market-based instruments (MBIs) which are an inherent part of open market economic policies.

In this chapter we examine why industry favours a C&C approach despite the many advantages MBIs offer. This is especially so in a post economic liberalisation era when a plethora of MBIs are available with clear advantages. It is interesting to note that Sri Lanka has a history of using only C&C approaches to mitigate pollution. The country is yet to implement MBIs. The consequence of such an approach is that it creates no dynamic incentive for firms to innovate or to use more efficient technologies. C&C are also not cost-effective. On the other hand, MBIs can be designed to create the desired incentives for polluters. Furthermore, MBIs are less cumbersome. However, despite its merits, MBIs, too, have drawbacks, which mean that they should be examined on a case by case before implementation. In some situations, a mixture of C&C and MBIs are warranted, depending on the situation.

The regulatory and environmental economic literature is relevant to answer as to why a country would go down the path of using only C&C approaches and why firms may favour or demand a regulatory approach. The theory and empirical evidence drawn from the relevant literature ranges from public acceptability, precautionary principle, capture theory to pollution haven hypothesis. These hypotheses are dealt with in detail and illustrated by appropriate diagrams not attempted before. We also demonstrate the consequences of such action which are likely to impact on economic growth and the welfare of the country. There are many policy implications stemming from adopting a wholly C&C regulatory approach. Such an approach also sends incorrect signals to potential investors. However, it must be mentioned here that despite these arguments, introducing MBIs also mean establishing a new setup for pollution control which the country has to experiment with which may take many years or even decades to perfect.

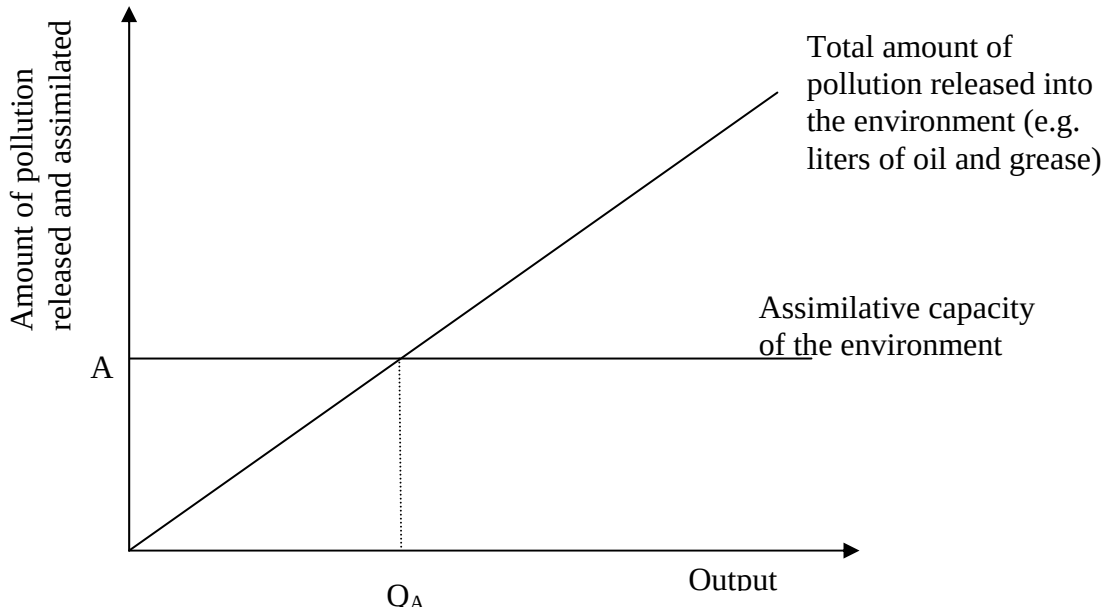
The challenges that lie ahead are many, including polluter opposition and overcoming political and bureaucratic hurdles.

The chapter is set out as follows. Section 2 provides an overview of the command and control vs. market-based approaches, and Section 3 presents a discussion on what pollution control approaches are used in Sri Lanka. Section 4 discusses the likely reasons for a wholly C&C regulatory bias. In Section 5, we discuss the environmental and health effects, and Section 6 discusses the policy implications. Section 7 concludes with a discussion of the main results.

2. Command and control vs. market-based approaches

Production of any form inevitably generates pollution. However, it is not always necessary to clean-up all the pollution if the assimilative capacity of the environment is greater than the amount of pollution and no negative externalities are present. It is only when the pollution generated by a firm or firms put together exceeds the assimilative capacity of the environment and negative externalities occur that preventive action is necessary. This is shown in Figure 1.

Figure 1: Output, pollution and assimilative capacity of the environment

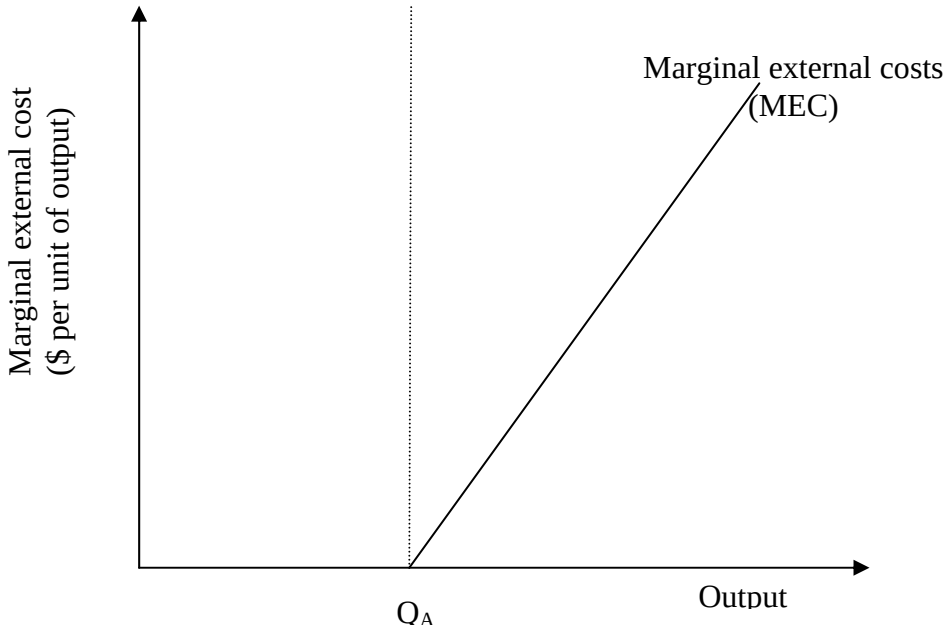


Source: Adapted from Turner et al., (1994, p.75).

As pointed out by Turner et al., (1994) when output increases so does the amount of pollution which has to be assimilated by the environment. However, with increasing production, the amount of pollution released exceeds the assimilative capacity of the environment. Hence, pollution released becomes a problem. Figure 1 shows that at Q_A output produced is equal to the amount of pollution released into the environment. When output increases beyond Q_A then the environmental assimilative capacity is exceeded.

Once the pollution released into the environment is greater than the assimilative capacity, it begins to impose external costs on society. Furthermore, the external costs increase with increasing output. A simple illustration of this is shown in Figure 2. As can be seen, marginal external costs (MEC) increase as pollution accumulates with increasing production. Hence, the damage done to the environment, too, increases when the per unit of output increases.

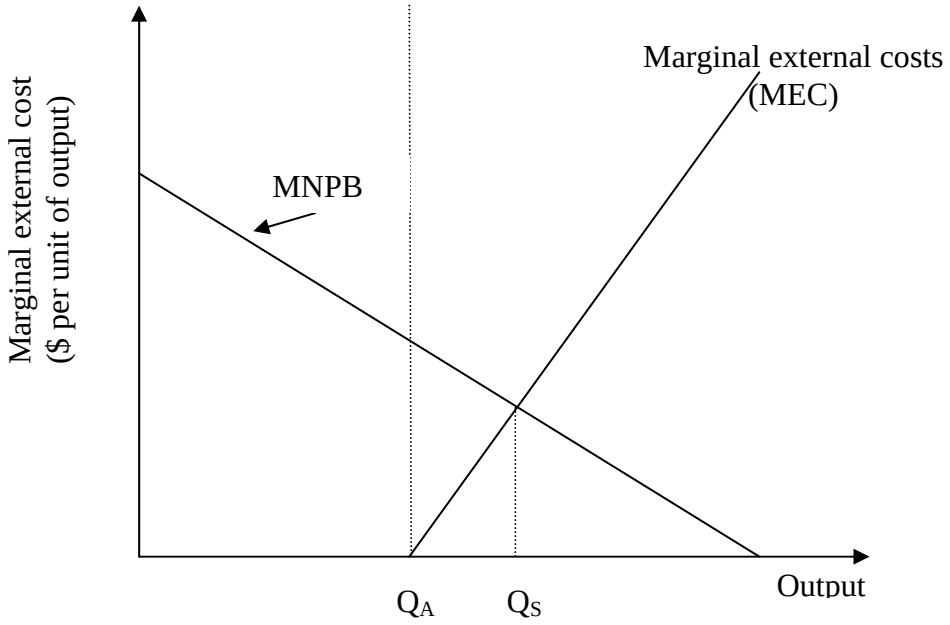
Figure 2: Increasing output and marginal external costs



Source: Adapted from Turner et al., (1994, p.76).

In order to avoid pollution damage to the environment and hence society, it is important to take into account marginal external costs and internalise them. This is shown in Figure 3.

Figure 3: Marginal net private benefit, marginal external costs and social optimum level of output



Source: Adapted from Turner et al., (1994, p.76).

In Figure 3, the social optimum level of output is at Q_s. This is obtained by subtracting the external costs from the producers' MNPB. It is the responsibility of the respective decision-makers to take into the social costs of production and compel polluters to pay for the pollution they generate. Only when these external costs are taken into account (internalized) that production will move from a private profit driven market optimal level of output to a socially optimal level of output. In other words a private firm's market decision rule is that output should be produced if the firm gains a positive marginal net private benefit (MNPB) (i.e. if MR>MVC), up to the point where MR=MVC, the market optimum level of output. If the regulators are to take into account the costs of pollution into account then the social decision rule is that external costs (MEC) must be included in the market price of the good produced. In other words, polluters should be made to pay for the pollution they generate in producing goods and services.

The primary virtue of a market system is that it shows the cost of conserving a commodity or providing a service and to producers what values consumers place on them. However, an unfettered market system does not take into account the true value of using non-market, freely provided environmental resources. Hence, freely available

environmental goods and services are over utilized and unfettered markets use resources inefficiently. In other words, as Turner et al., (1994) point out 'there is a divergence between private and social costs'. This concept was discussed in Figure 3 above.

Hence, as demonstrated in Figure 3, there is a need to account for the social costs in market prices of manufactured goods and services. This is known as the polluter pays principle which MBIs have been designed to achieve. MBIs can be contrasted with a direct regulatory C&C approach. Regulatory C&C approaches require changes in behaviour by introducing penalties for parties who don't comply with the regulatory provisions. There are different types of C&C instruments which include standards (including planning instruments), licensing, mandatory management plans and covenants.

A commonly used C&C approach is setting uniform standards for firms and often (and most common) are setting standards in relation to technology and/or performance (Stavins, 2003, ch 9). As Stavins points out 'Technology-based standards specify the method, and sometimes the actual equipment, that firms must use to comply with a particular regulation. A performance standard sets a uniform control target for firms, while allowing some latitude in how this target is met'. As Young (1992) points out, one of the reasons why C&C is favoured is because less information is required to introduce them.

One of the criticisms of the C&C approach is based on firms being regulated to the same target which is expected to be costly and even counterproductive. While theoretically this approach is intended to limit pollution, it is likely to impose different costs to different firms and costs can vary between firm's characteristics such as age, location and other factors. Such an approach may also lead to firms' to 'alter' their behaviour in order to avoid or reduce the costs of compliance. Furthermore, policing compliance is no doubt expensive with no revenue generated. It is likely that most of the compliance costs have to be borne by the regulator since the costs of issue a licence is low. In addition, there are other drawbacks as well which are well documented in the environmental economics literature (see for example, Callan and Thomas, 2007). Some of them include: C&C allow little flexibility in achieving pollution targets; does not encourage innovation; or provide incentives for polluters to change behaviour in order

to reduce pollution and be rewarded; does not encourage competitors to reduce pollution; monitoring of thousands of production units is a very costly affair for the regulator; and historically, penalties have been set below the social cost of production (where it contributes to market failure and inefficiency). This aspect is discussed further later in this section.

On the other hand, MBIs are policy tools that encourage behavioural change through market signals rather than through explicit directives or 'one size fits all' approaches. It has been argued that MBIs are 'regulations that encourage behaviour through market signals rather than through explicit directives regarding pollution control levels and methods' (Stavins, 2003) discussed above. MBIs are designed to make use of market forces (Stavins, 1988; OECD, 1989, 1998) if well designed and implemented enable polluters to undertake pollution control that enable sustainable production (benefits them in the long-term) and also meet regulator objectives. Such as system also generates revenue as opposed to C&C where most of the regulator costs have to be borne by the regulator. MBIs encourage polluters who can most cost effectively provide environmental improvements. There is a growing interest in MBIs because they can, where applicable, deliver equivalent outcomes at lower cost by allowing firms the flexibility to decide on whether to change their actions or incur higher costs. Importantly, regulators do not require detailed information on who is best placed to make changes and how. This information is 'revealed' by the market. However, it must be mentioned here that MBIs often require some regulatory underpinning in order to make them work.

A large number of countries that rely on market forces now use MBIs (for a discussion see Stavins, 2003). They are both in developed and developing countries. Where appropriate and necessary MBIs are complemented with the CAC approach (for a discussion see Seroa Da Motta et al., 1999). Very few countries, especially those that rely on market forces adopt a wholly C&C regulatory approach. Hundreds of MBIs or variants have been developed and implemented which range from pollution charges (fees or charges); tradeable permits; market friction reductions and government subsidy reductions (for a detailed discussion, see Stavins, 2003).

The various C&C and MBIs available for policy decision-makers have been neatly summarised by Seroa Da Motta et al., (1998). This is shown in Table 1. As can be seen, a plethora of instruments are available for pollution control and depending on the type of pollution, institutional capacity and other factors, instruments can be selected by the policy decision-makers to suit their comparative advantage.

The various instruments that are available for pollution mitigation were discussed and very briefly the main advantages and disadvantages between the two approaches were noted. Before, concluding this section we demonstrate as to why an MBI instrument can be more effective than a C&C approach. For this purpose, we compare a pollution tax (which has traditionally been more effective) with a penalty set for violating a fixed standard for effluents or emissions.. Interestingly, real world experience shows that penalties for violating a fixed standard have been historically set 'too' low). This is shown in Figure 4.

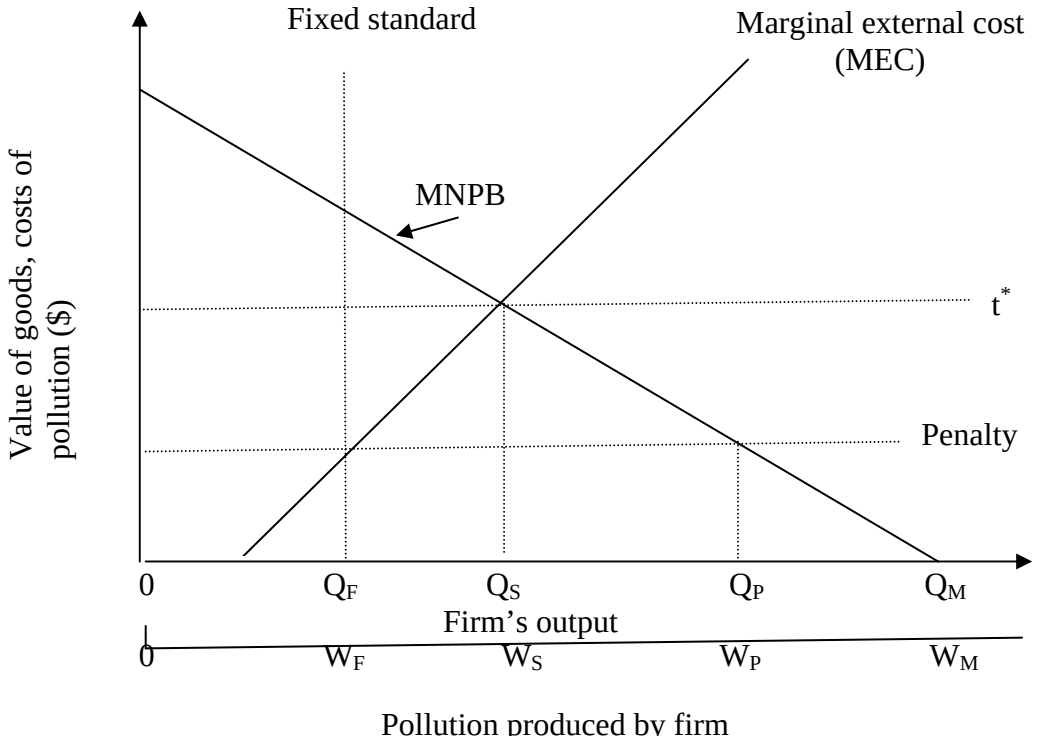
Table 1: Classification of policy instruments available for pollution mitigation

← Minimum Flexibility →	← Moderate Flexibility →		← Maximum Flexibility →	
← Maximum Government Involvement →			← Increased Private Initiative →	
← Control Oriented →	← Market Oriented →		← Litigation Oriented →	
Regulations and sanctions	Charges, taxes and fees	Market creation	Final demand intervention	Liability Legislation
General Examples				
Standards: Regulator restricts nature and amount of pollution or resource use for investors. Compliance is monitored and sanctions made (fines, closure, jail terms for non-compliance	Effluent or user charges: Regulator charges fee to individual polluters or resource use. Fee is high enough to create incentives to reduce impacts	Transferable permits: Regulator establishes a system of tradable pollution or resource use permits and monitors compliance. Polluters or resource users trade permits at unregulated market prices	Performance rating: Regulator supports a labelling or performance rating program that requires disclosure of environmental information on the final end-use of the product	Strict liability legislation: The polluter by law is required to pay any damages to those affected. Damaged parties collect settlements through litigation and courts system
Specific examples of application				
➢ Pollution standards ➢ Licensing of economic activities ➢ Land use restrictions ➢ Environmental guidelines ➢ Fines for spills ➢ Bans applied to use of certain materials ➢ Quotas	➢ Non-compliance pollution charges ➢ Royalties and financial compensation ➢ Pollution taxes Tipping fees ➢ User charges	➢ Deposit-refund systems for solid and hazardous wastes ➢ Property rights attached to resources potentially impacted by urban development	➢ Education regarding recycling and re-use ➢ Disclosure legislation requiring manufacturers to publish solid, liquid and toxic waste generation ➢ Blacklist of polluters	➢ Damages compensation ➢ Liability on neglecting workers and environmental authorities

Source: Adapted from Seroa Da Motta et al., (1998).

Theoretically, introducing a fixed standard for effluents or emissions should limit the amount of pollution released into the environment. This is shown at Q_F of firm's output. The amount of pollution released is W_F. However, if the fine set for violating the standard limits a fine is imposed. If this is set too low, (as experience shows), which is shown by the broken line, then firms may only reduce pollution where the penalty>MNPB. In other words, reducing output from Q_M to Q_P (reducing emissions from W_M to W_P). On the other hand, the tax, t* has been set to achieve the socially optimum output at Q_S where pollution generated is W_S. This is efficient, where as if the penalty is to be efficient, then the level of penalty has to be increased to the level of tax, t*.

Figure 4: Comparing the effectiveness of a pollution tax with a fixed emissions standard associated with penalties



Source: Adapted from Turner et al., (1994, p.169).

Figure 4 clearly demonstrates why emissions standards where fines are set too low are inefficient. Historically, this has been the case with pollution standard penalties. With these arguments in mind we examine the experience of pollution control approaches adopted by policy decision-makers in Sri Lanka.

3. What pollution control instruments are used in Sri Lanka?

With Sri Lanka's participation in the United Nations Conference on Human Environment held in Stockholm in 1972, the policy decision-makers have expressed a keen interest in protecting and conserving the country's natural resource endowment. However, the national responses have remained sporadic and ad hoc until safe guarding the environment was embodied in the constitution of the country in 1978. Article 24(14) of the Constitution reads 'The State shall protect, preserve and improve the environment for the benefit of the community'. Article 28 states 'it is the duty of every person in Sri Lanka to protect nature and conserve its riches'. Interestingly, in the same year Sri Lanka adopted open market economic policies which meant lessening of reliance on C&C approaches and a greater role for market forces to play a part.

However, despite the market forces playing a great role in the economy, the approach Sri Lanka has adopted in protecting the environment and mitigating pollution has been one of C&C despite the availability of many MBIs to mitigate pollution and to protect the environment. This is one area that Sri Lanka has lagged behind despite the many disadvantages of C&C approaches and what MBIs have to offer as discussed in Section 2. The reasons as to why Sri Lanka continues to rely on inflexible, and to some extent outdated and in-effective approaches, are dealt with in Section 4. However, before that we discuss further Sri Lanka's heavy emphasis and reliance on C&C approaches.

With the enactment of the new constitution in 1978, a national seminar was sponsored by the government with the main objective of soliciting recommendations of desirable legal reforms, suitable institutional and administrative structures, dissemination of information and education and training for the effective protection and efficient management of the environment. The outcome of these recommendations was the drafting of the National Environmental Act (NEA) which was passed by the Parliament in August 1980 and the establishment of Central Environmental Authority (CEA). The main objective of establishing CEA was to 'make provisions' for the:

- protection, management and enhancement of the environment

- regulation maintenance and control of the quality of the environment
- prevention, abatement and control of pollution

The strategy adopted of achieving these objectives since the NEA was passed was largely through legal instruments. Two significant examples to this effect are the Environmental Protection License (EPL) scheme for those industries that discharge effluents in 1988 and the introduction of Environmental Impact Assessments (EIA) to all development projects in 1993. The CEA thus became the implementing arm of the NEA and, therefore, took the position of the main regulatory agency of the government for the protection and management of the environment in the country. As reflected in the title, CEA is seen as the body of the government exercising its 'authority' as a regulatory agency. The underlying concept is that the protection of the environment is possible only through C&C approaches. As an example of this regulatory approach in Sri Lanka, Table 2 shows the polluting status, type of firm and number of firms registered with the Board of Investment (BOI) in the country from 1996-2007. The districts and provinces where they are located is also shown. What is interesting here is that one single standard may be applied to specified firms producing the same product (e.g. textiles), no matter where they are located in the country. Environmental sensitivity of the district or province may not be taken into account. This is a problem because we know that the assimilative capacity of the environment may vary a great deal within regions.

Table 2: Polluting status and number of firms registered under BOI in Sri Lanka from 1996-2007

Level of pollution	Number of firms	Percentage of firms in each sector	Percentage of firms in each district	Percentage of firms in each province	Number of firms as a percentage of total
Low	15	TL=33,TW=33, FD=27, CH=7,	CM=33,GQ=33, KT=27, AD=7,	WE=93, NC=7,	2.58
Medium	20	FD=30,CH=25,TL=20, MP=15, BM=5,PP=5,	GQ=40, CM =30,GL=10,HB=5, KT=5,MG=5, NW=5,	WE=75,SU=15, CE= 5, UV= 5,	3.44
High	103	CH =33,FD =26, TL =26,MP =7, IE =4,BM = 2, ME =1,TR =1,	GQ=40,CM=27,KT=10,KY=7, GL=3,HB=2,NW=2,TC=2, AP=1,BD=1,KE=1,KG=1, MG=1,MR=1,MT=1,	WE=77,CE=10, SU= 6,NE = 3, UV= 2,NW= 1, SA= 1,	17.70
Other	444	TL=68, CH=14, BM=5,FD=5, MP=3,SL=2,ME=1, PP=1, SP=1,	CM=32,GQ=20,KT=12,KY=6, RN=5,GL=4,HB=4,AD=3, KE=2,MR=2,MT=2,NW=2, PO=2,BD=1,MG=1,	WE=67,SU=10, CE=9,NC=6, SA=6,UV=2,	76.29
Total*	582	Number of sectors =12	Number of districts =18	Number of provinces = 8	100.00

Note (i): Abbreviations (1) sectors: BM -Basic metal, CH -Chemical sector, FD -Food sector, ME- Machinery and equipment, MP- mineral products, PP-Paper and pulp, SL-Lodging service and hotels, SP- Power services, TL-Textile and leather, TR-Transport and transport services, TW-Timber and Wood industry, IE-not defined.
(2) Districts: AD – Anuradhapura, AP – Ampara, BD – Badulla, GL – Galle, HB –Hambantota, KE –Kegalle, KG-Kurunegala, KT-Kalutara, KY- Kandy, MG-Moneragalle, MR-Matara, MT-Matale, NW- Nuwara Eliya, PO- Polonaruwa, RN-Ratnapura, TC-Trincomalee, CM-Colombo, GQ- Gampaha.
(3) Provine: WE- Western, SU- Southern, CE-Central , NE – North Eastern, NC- North Central, NW – North Western, SA – Sabaragamuwa,UV - Uwa
Note (ii) * This row shows the total number under each classification.

Source: Board of Investment of Sri Lanka (2008).

The enforcement of all provisions under the NEA is undertaken by the BOI in respect of all projects established within its Export Processing Zones (EPZ). In respect of enterprises outside the export processing zones, BOI grants environmental clearance and issues environmental protection licences after obtaining the necessary clearance from the CEA (BOI, 2008).

Other means of environmental management are either not considered nor are they understood. This is despite MBIs being widely discussed in the relevant literature and implemented in some countries (for example see, OECD, 1989; Da Motta, et al., 1999). For instance, the OECD (1989) discussed these instruments in the late 1980s while MBIs have been debated in the USA since the 1970s (Nelson, 1987; Hanley et al., 1997).It appears that reliance on C&C approaches for pollution control, at least for firms registered with the BOI involves adhering to specified standards set for firms depending on the type of pollutant. An example of a typical pollution standard (ambient air quality) set for registered firms with BOI is shown in Table 3. For other standards specified by BOI for various sectors and pollutants are listed by BOI (2008).

Table 3: An example of ambient air quality standards set by the environmental regulator in Sri Lanka

Pollutant	Averaging Time*	Unit	Standard	Measurement Method
Carbon Monoxide	8 hr	mg/m^3 (ppm)	10(9.0)	Non-dispersive infrared Spectroscopy
	1 hr		30(26.0	
	Any time		58(50.0)	
Nitrogen Dioxide	24 hr	mg/m^3 (ppm)	0.10(0.05)	Colorimetric using Saltzman method or Equivalent (gas phase chemiluminescence)
	8 hr		0.15(0.08)	
	1 hr		0.25(0.13)	
	24 hr			
Sulfur Dioxide		mg/m^3 (ppm)	0.08(0.03)	Pararosaniline method Or equivalent (Pulsed fluorescent method)
	8 hr		0.12(0.05)	
	1 hr		0.20(0.08)	
Ozone	1 hr	mg/m^3 (ppm)	0.20(0.10)	Chemiluminescence Method or equivalent (ultra violet photometric method)
Lead	Annual	mg/m^3	0.0005	Hi-volume sampling, Wet ashing/atomic absorption or aspectroscopy
	24 hr		0.002	
Suspended Particulate Matter(SPM)	Annual	mg/m^3	0.10	Hi-volume sampling And gravimetric
	24 hr		0.30	
	8 hr		0.35	
	3 hr		0.45	
	1 hr		0.50	

*Minimum number of observations required to determine the average over the specified period: 03 hour average – 03 consecutive hourly average.
08 hour average – 06 hourly average.
24 hour average – 18 hourly average.
Yearly average – 09 monthly averages with at least 02 monthly average each quarter.
By wet chemistry methods or by automated analysers

Source: Board of Investment of Sri Lanka (2008).

Interestingly, despite these precise pollution standards being set, it appears that these standards have not been able to mitigate pollution judging by the continual degradation of the environment due to the discharge of pollutants, particularly waste

water to water bodies causing deteriorating water quality. It must be pointed out here that very few polluters exceeding the set uniform standards have been penalised and even in such cases, the penalties have been low. A scenario of setting low penalties was shown in Figure 4, in Section 2. Judging by the pollution generated and the external costs generated, it is obvious that C&C approaches have not had their desired effect. Judging by the budget set aside for EPA to enforce these standards, it is not surprising that non-compliance is high. Furthermore, little action has been taken to rectify the situation.

However, policy decision-makers have realised the limitations of the C&C approach and hence they have initiated a number of preliminary studies to assess the suitability of MBIs to mitigate environmental pollution since 1994. For instance, a study undertaken in 1994 by Environmental Resources Management (ERM) Ltd. U.K. recommended levying a fee on the volume of waste water discharged by industries to reduce waste water pollution. Furthermore, another study entitled "The introduction of effluent charges as a means of controlling water pollution in Sri Lanka" conducted by the Institute of Policy Studies (IPS) in 1998 recommended the use of a fee-based charge on the Chemical Oxygen Demand (COD) load contained in waste water discharged into the environment. A more comprehensive study with a plan for implementation was presented under the Environmental Action One Project (EA1P) in 2002 funded by the World Bank. These initiatives to introduce MBIs to date have been confined to paper. However, the seriousness of the deteriorating water quality in the country has drawn the attention of the policy decision-makers in recent years to MBIs. The action that was decided was to implement a wastewater discharge fee (WDF) program from July 2008 which, however, has not come into force yet. Here, too, the emphasis was on legal concerns of WDF, while paying some attention to institutional aspects, rather than the technical and economic aspects of WDF. The focus of CEA is still largely on compliance rather than on arresting pollution. At present, the CEA has set a target to prosecute at least a minimum of 100 violators per year.

Therefore, MBIs for environmental management and protection are yet to be introduced in Sri Lanka. The question that arises then is what are the reasons for Sri

Lanka to be slow in complementing CAC approaches with MBIs? The likely hypotheses are discussed in Section 4.

4. Likely reasons for a wholly C&C regulatory bias

As the analysis in Section 3 showed Sri Lanka relies heavily on a C&C approach to maintain environmental quality. What is also interesting is that despite Sri Lanka undertaking open market economic reforms and deregulating some of the major public utilities since 1978, the environmental approaches and solutions have been wholly C&C.

So why has Sri Lanka adopted and continue to rely on C&C approaches despite the inefficiencies and short shortcoming of a regulatory approach and benefits that could be had from MBIs to mitigate pollution and maintain environmental quality? In order to explain these phenomena, literature from regulatory and environmental economics is used.

This question has been examined partly by Hahn (1989); Cumberland (1990) and Hanley (1998) in the environmental economics literature and by Viscusi et al., (1995); Church and Ware (2000) in regulatory economics. Based on the literature, we present a few scenarios below.

One view put forward is that there is ignorance on the part of policy decision-makers (Hanley et al., 1998). Beckerman (1975) has argued that policy decision makers have been unaware of the advantages of MBIs. In Sri Lanka, this might have been the case prior to 1978 economic liberalisation policies, but the same could not be said after the 1978 reforms, especially in the last two decades where MBIs have been well known to decision-makers and they have been widely used in some countries, including developing countries. This is especially so because many Sri Lankan environmental managers, lawyers and economists have had at least some form of training in countries where these instruments are widely used. Hanley et al., (1997) point out that ignorance is no longer the case, at least in industrialised countries such as the UK and the US. A survey conducted by Hanley et al., (1990) among policy decision-

makers and regulators in the UK found at least a superficial knowledge of economic instruments among them.

We know from the regulatory economics literature that one straightforward approach to addressing market failure arising from environmental pollution is for governments to adopt 'legal coercion' (Church and Ware, 2000). In other words, to adopt a C&C approach. This action would be consistent with Sri Lanka's 1978 constitution which pledges to safeguard the environment. For example, see article 24(14) of the constitution discussed in Section 3. A C&C approach is one way of ensuring that adequate environmental safeguards are in place. Furthermore, according to the regulator, a C&C approach becomes all the more relevant and justified where persistence substances are being released into the environment or when the pollution could result serious health damage, or when there is uncertainty about the pollution impacts. Those regulators with a background outside economics prefer this approach. In such a case the precautionary principle (e.g. a safe minimum standard) is applied by the regulator. Hence, if the goal is to totally prevent some emission or effluent, then strict regulation becomes the preferred instrument which is more efficient, dependable and theoretically the safest approach to take. Furthermore, such an approach is also politically attractive and acceptable.

Hence, a C&C approach adopted by the regulator could also be due to a response to the public's demand to address market failure (see for example, Church and Ware, 2000). The public perception here is that market-based instruments are incapable of internalising externalities. It is perceived that a C&C approach can result in net welfare gains and it is this potential for welfare gain that generates the public demand for regulation. They have a high degree of acceptability because of the political (public, especially environmental groups) and administrative support they generate (Turner et al., 1994; Hanley et al., 1997).

Following Viscusi et al., (1995), the externality and welfare aspects can be illustrated to make the arguments clearer. For example, let's assume that the maximum value an individual is willing to pay for a product is V and the price of that product is P. Then if V>P, the individual will buy the product and receive a surplus V-P, which is positive. This is a situation where there are no externalities. Now assume that a

negative externality, W, is present (as is usually the case with any economic activity). Now, the welfare effect of purchasing that commodity is (V-P) –W. Hence, if W> V-P, then society's welfare is reduced. The argument here is that the majority of the public perceive that market-based instruments (as opposed to regulation) result in too much economic activity being pursued. On the other hand, the public perception is that only a C&C approach, such as through a standard, that negative externalities can be avoided. Hence, the argument here is that there is demand for regulation from groups and that 'the political process provides incentives for governments and politicians to supply regulation' (Church and Ware, 2000).

Furthermore, opposition to MBIs come from ethical implications of economic instruments (Hanley et al., 1997). Kelman (1981) has pointed out that placing a price on the right to pollute is somehow inconsistent with the notion of environmental quality. His survey of US environmental lobbyists found that 68 percent of those interviewed took this view of pollution taxes.

In addition, it is well known in the regulatory economics literature that by design or not, the institution that is meant to regulate is 'captured' by industry. This is known as capture theory (Viscusi et al., 1995). According to this strand of thinking, C&C regulation is supplied by the regulator in response to the industry's demand for regulation or the regulatory authority is controlled by industry by coercion, influence and 'other methods'. However, in both cases, regulators are' controlled' by an industry or a firm. Turner et al., (1994) elaborate this point best:

"*This 'capture' concept refers to the tendency for the regulator and the polluter to seek common ground and cooperation. Once captured, administrators begin to see that they need to protect existing members of an industry and, therefore, regulate it accordingly. New entrants are excluded, subsidies are offered and difficult decisions are put off until prospects 'improve'*".

Young (1992) argues that this 'rent seeking' behaviour is inefficient and tends to bias investment decisions and leads to further extensions in regulatory capture. Some studies [see for example, Keller and Levinson (2002); List et al., (2000); List et al., (2004)] show that pollution abatement costs impact on investment decisions. The

hypothesis is that when the pollution abatement costs are high, investors tend to move to places where pollution regulation is less. This is known as the pollution haven hypothesis.

It is not difficult to figure out as to why firms would demand C&C environmental regulation as opposed to demanding the use of MBIs. This is especially so in developing countries, although this practice is not uncommon in developed countries. We know that the main objective of a firm is to maximise its profits. In such a situation, a C&C regulatory framework is preferred because the environmental regulatory framework under which it has to operate is more attractive to maximise the firm's economic returns rather than under a MBI framework. Interestingly, Kelman (1981) found from a survey of industrialists in the US that 85 percent of them were opposed to pollution taxes on the grounds that these increased the financial burden relative to a C&C regulatory approach. This view is elaborated further in Figure 5.

Figure 5: Preference for pollution control approaches by a profit maximising firms

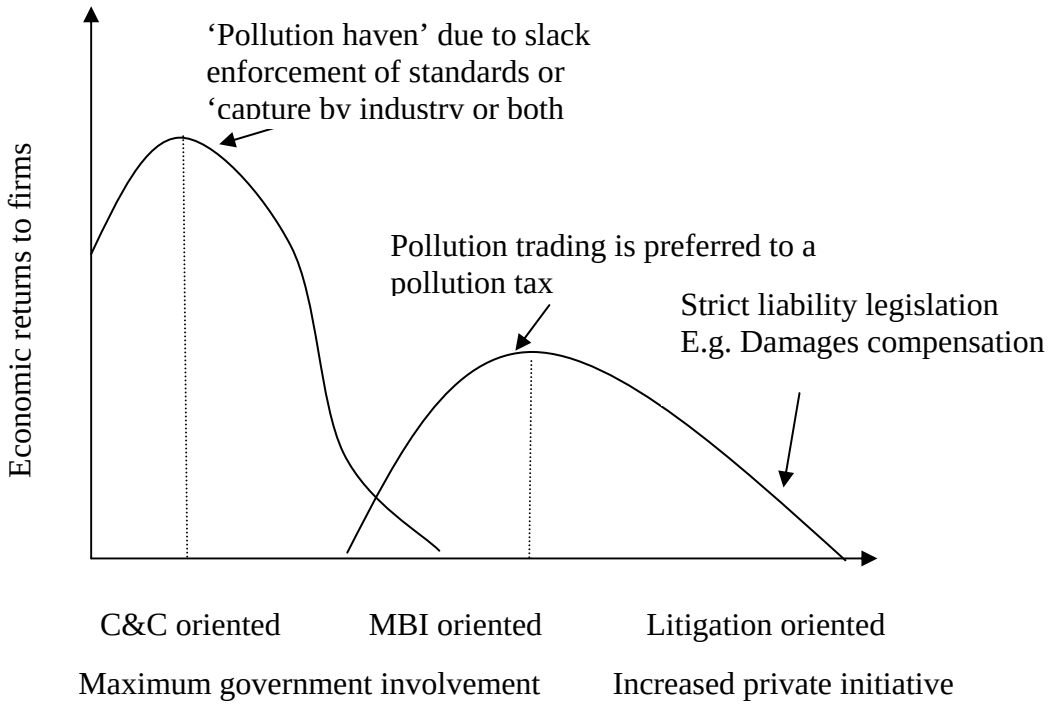


Figure 5 shows the pollution control approaches and the economic function for profit maximizing firms. The vertical axis shows the economic benefits to producers (firms) and the horizontal axis shows the pollution control approaches taken from Table 1 in Section 2. The pollution control approaches close to the origin are C&C oriented (maximum government involvement) and as we move rightwards they become more litigation oriented (increased private initiative). The figure shows that producers who escape paying the social costs of pollution have higher economic returns. For instance, under a C&C approach, the penalties set are low. Industry or firms capture the regulator to keep penalties low. Alternatively, firms escape paying the full social costs of production using coercion and other means. On the other hand when C&C involvement becomes less and MBIs are used, the extent of escaping paying social costs is less. This is because, for instance a green tax can be levied at the point of sale to internalize the external costs of producing a per unit of output. Industry coercion is less. Hence, economic returns fall when pollution control approaches used move towards MBIs. Industry, obviously attempts to avoid such instruments. However, it should be pointed out that industry is likely to prefer a pollution trading scheme over a pollution tax for obvious reasons. As the pollution regulatory system moves towards a litigation approach (increased private initiative shown in Figure 5), the economic

returns become even less because of the extent of private compensation due to for example, irreplaceable damage or deaths. Hence, in extreme cases and (and in some years), economic returns can be close to zero under strict liability legislation. Hence, based on this analysis it is possible to show which regulatory approach will be preferred firms if given the opportunity. This line of analysis is similar to the Stiglerian approach in regulatory approach [see Viscusi et al., (1995)] for a detailed analysis of this approach.

Finally, Hanley et al., (1997) also point out that resistance to change can come from those who have a vested interest in 'the preservation of the existing system, while bureaucracies in general may resist wholesale changes in policy'. They point out that economic instruments in the OECD countries were introduced 'gradually rather than as a dramatic change'. Changes are inevitable, especially when the benefits of MBIs become known. However, those with vested interests will strive to retain the old system because it serves their own interests better.

Environmental and health effects

By not accounting for social costs of pollution, producers (firms) clearly benefit from such production. In other words, not taking into account the social costs increase the economic returns to firms. This is because firms are using unpriced environmental goods and services free of charge. In other words, the firm is over utilizing resources because the price paid for such goods and services is zero.

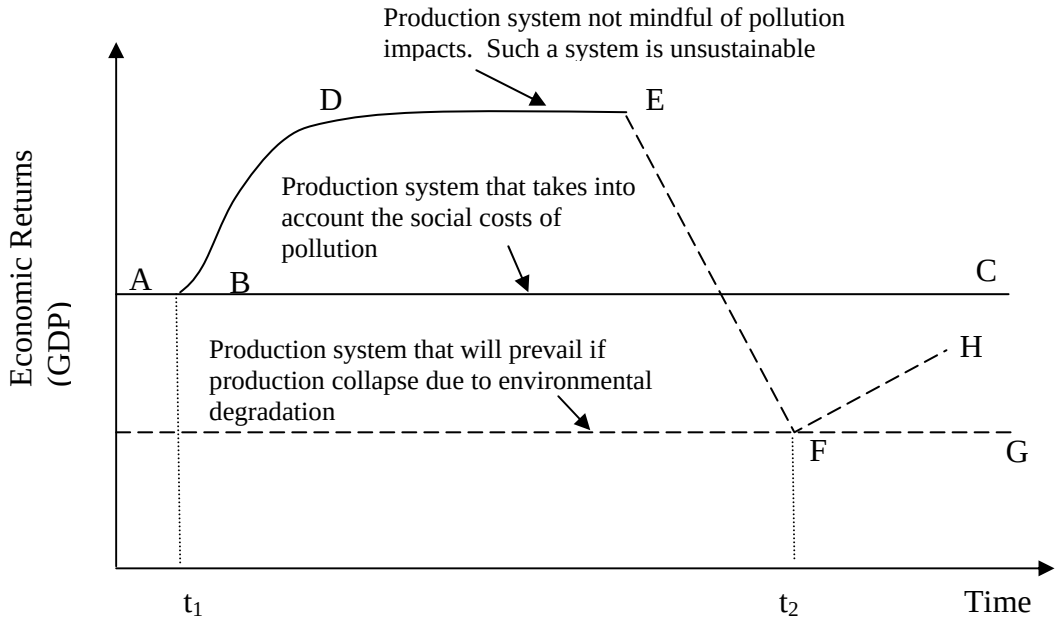
However, such a strategy has many social costs since pollution generated from hundreds or even thousands of firms (see Table 2) has various impacts. For example, pollution affects health (human capital), environment (biodiversity), capital and other production processes. These impacts are well documented in the relevant literature (for example see WRI, 2009). As pollution increases, so do the severity of impacts and very often the impacts are magnified. Furthermore, the impacts are not only within the sector but also affect other sectors as well. The impacts are also intergenerational. Not only are the use and non use environmental values are damaged, but the optional (future) values are also damaged. Some of the impacts also

cause irreversible damage (e.g. extinction of species). This is especially so for an island that is very rich in biodiversity.

While the use of resources in this manner clearly benefits private producers (firms) such a strategy will no doubt have an impact on the environment and thereby on society as a whole.

As discussed in Section 4, myopic, foot-loose profit maximising firms are likely to favour a C&C approach to pollution control. This they do to maximise their gains and the regulator may not intervene for fear that firms may leave if costs of compliance (covering social costs) increase. Such a strategy, although increases production and result in higher economic growth and output (measured as GDP), the social costs are likely to reduce output in the medium and in the long term due to pollution damage to factors of production in the form of environment (land), health (labour) and capital. Stiglitz (2009) mentions such a situation in an article entitled 'GDP Fetishism'. This scenario is illustrated in Figure 6.

Figure 6: Economic growth without considering pollution impacts is detrimental to future production



The line ABC represents economic growth when pollution is checked. Economic growth is assumed to be constant. This is a sustainable path where the pollution

released into the environment is cleaned up. The environmental and health impacts are not major. This limits economic growth, but more sustainable. However, if external costs are not taken into account, more output will be produced. This is because only the private costs of production are considered. When such a system is adopted at time t_1, high economic returns (GDP) are generated which is shown by line BDE. Under such a system economic returns (output) are much larger because social costs of production are not taken into account. However, the system has a problem. It is unsustainable. This is because the pollution released is greater than the assimilative capacity of the environment and very little clean-up is involved, pollution begins to impact on production and hence economic growth. This is shown by the falling broken line, EF. Production will continue on FG line and will remain so for a long time if factors of production have been damaged or disappeared. On the other hand if the environment recovers, economic growth may take place at a higher level shown by the upward sloping line, FH. With time, it is possible to reach the ABC line. However, such a process is time consuming and may take decades for full recovery.

Policy implications

A multitude of policy implications arise by following a wholly C&C approach to pollution control. It has far reaching consequences for the control of pollution, investment and economic growth. They are discussed briefly.

First, a large number of MBIs have been in existence for more than three decades and they have been shown could be effective in internalising externalities. CAC has a role to play but relying wholly on such approaches is short sighted and does not spur innovation and development of new technologies.

Second, adopting a wholly CAC approach sends the wrong signals to potential overseas investors. In other words, this is saying that the country is adopting only a CAC approach, and hence it is subject to low compliance and pollution issues take a low priority. This idea is consistent with the pollution haven hypothesis. This means that polluting industries with old technology (meeting the basic standards) will invest. This strategy is a drawback to innovation and investment in ‘smart’ technology.

Third, pollution generated will result in negative externalities which will impact on economic growth and thereby affect society as a whole. This will no doubt impact on future production and generations.

Fourth, many economies are moving towards combating greenhouse gasses such as CO_2 in response to combating global warming. There is little doubt MBIs will play a big role in reducing greenhouse gasses in the next few decades. Hence, Sri Lanka will be left behind and looses credibility in taking action against global warming. Future green taxes could be imposed on the country's exports.

Fifth, having relied wholly on CAC instruments to control pollution in the country, Sri Lanka has a big task ahead in setting up the necessary administrative structures if and when MBI instruments are to be introduced. Setting up such a structure involving MBIs could be a long drawn out affair.

Conclusions

The merits and de-merits of a C&C approach and MBIs were discussed and it was shown that, at least theoretically, MBIs have a clear advantage. The use of MBIs is consistent with open market economic policies that Sri Lanka has adopted since 1978. However, to date the country has been adopting a wholly C&C approach to pollution control which in some respects is outdated. C&C approaches are synonymous with economic policies Sri Lanka adopted prior to 1978 open market economic reforms.

Despite the many environmental standards set for thousands of firms, pollution is a problem in the country and pollution is increasing. It is clear that the C&C approach Sri Lanka has adopted has shortcomings judging by the social costs of production imposed on society. Hence, this is an opportunity for MBIs to be implemented or even a combination of MBI and C&C approaches.

Since Sri Lanka continues to adopt a C&C approach to control pollution despite MBIs being less cumbersome it was imperative to hypothesise the likely reasons for doing so. They were discussed based on the literature on regulatory and environmental economics. The consequences of pollution exceeding the assimilative capacity were

discussed where it was shown that if pollution continues unabated, it is likely that the quality of life of society would decrease. This is due to environmental degradation and health effects. Furthermore, the policy implications of Sri Lanka using only C&Cs were discussed.

Given the issues discussed and Sri Lanka attracting foreign investment, especially in a post war period, it is imperative that policy decision-makers examine MBIs based on their merits. In any case the international experience shows that MBIs will play a greater role in the decades to come especially in a climate of combating greenhouse gasses. Sri Lanka in many respects has very few options left other than to undertake appropriate pollution mitigating reforms. The country is at an important crossroad.

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